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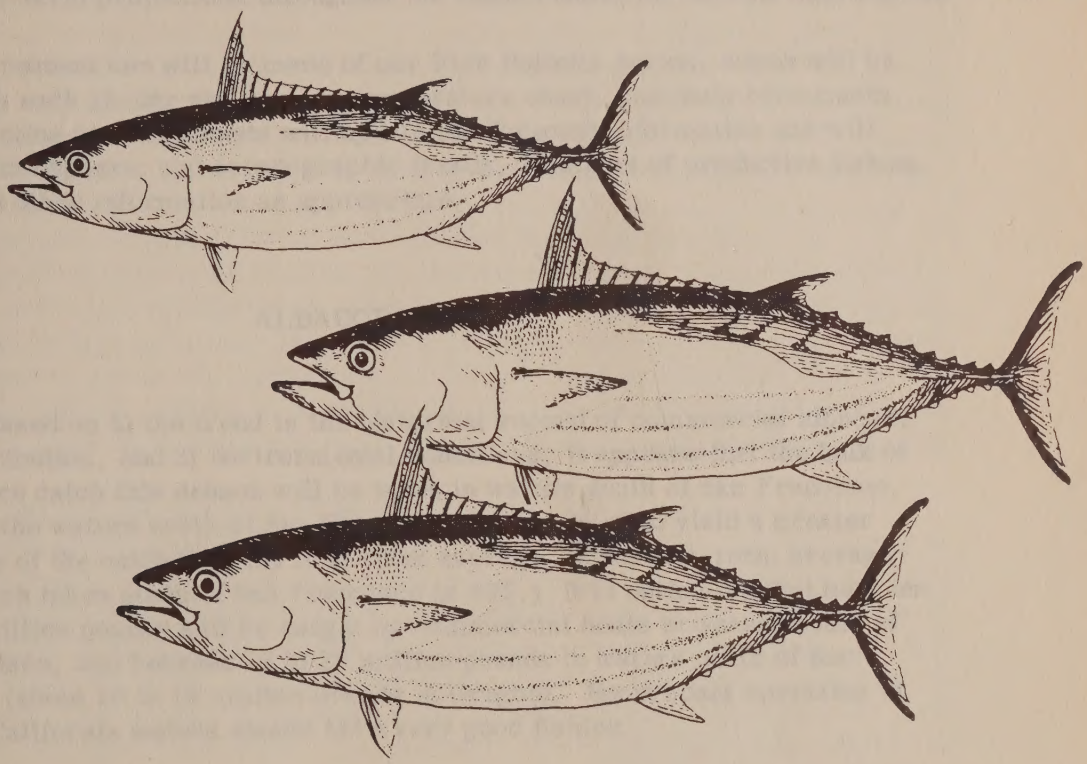
MAY 1971

FISHING INFORMATION

UNITED STATES DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

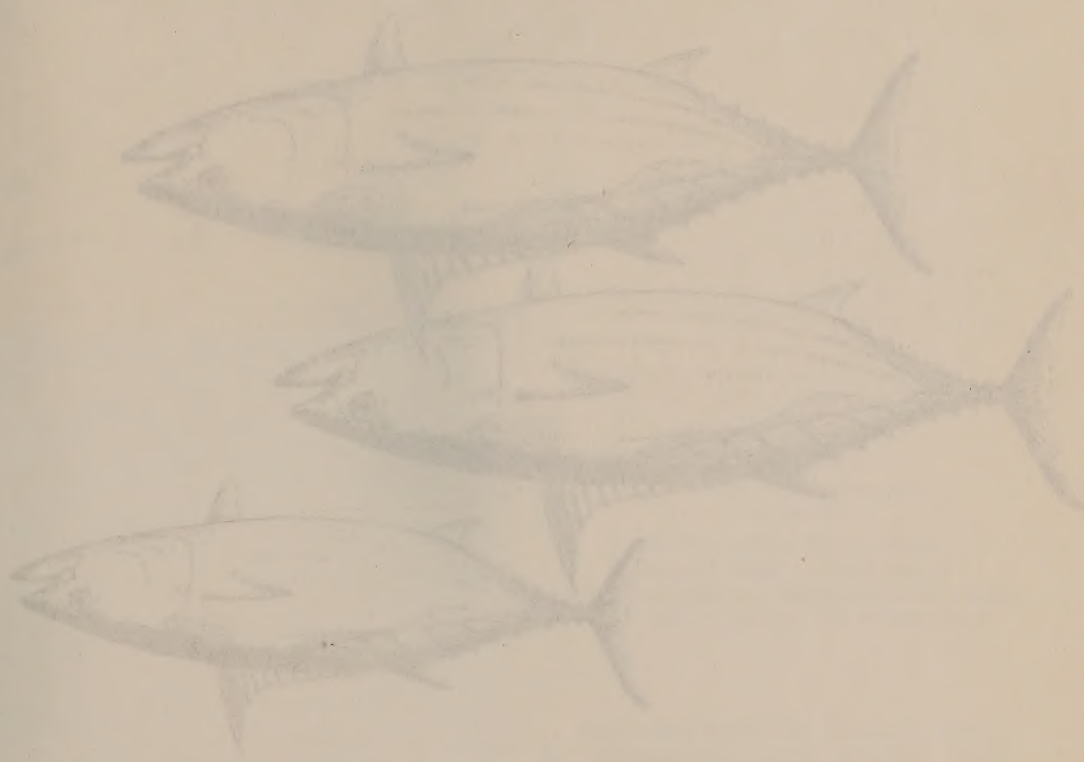


NATIONAL
MARINE
FISHERIES
SERVICE

FISHERY-
OGRAPHY
CENTER
LA JOLLA,
ALIFORNIA

Contents

	Page
Temperate Tuna Forecast for 1971	1
Commercial Fisherman's Directory Available	12
Narrative Description of Ocean Temperature Conditions	13
Sea Surface Temperature Charts, Pacific Ocean, May 1971	14



NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

UNITED STATES DEPARTMENT OF COMMERCE

FISHING INFORMATION

TEMPERATE TUNA FORECAST FOR 1971

This is the 11th annual advisory to be issued by the National Marine Fisheries Service (NMFS)--formerly Bureau of Commercial Fisheries--for the albacore and bluefin tuna fisheries off the North American Coast. Our pattern of operations this year is designed to take into account the fact that short-term environmental events may obscure long-term trends. Thus, in addition to the long-term landings and area forecasts presented in this advisory, we will issue short-term projections throughout the season based on current information.

Frequent use will be made of our Fish Bulletin series, which will be issued with each 15-day sea surface temperature chart, and daily broadcasts. These bulletins and broadcasts will update our forecast information and will include: atmospheric and oceanographic trends, locations of productive fishing areas, and other information as appropriate.

ALBACORE TUNA

Based on 1) the trend in the historical record of commercial albacore catch distribution, and 2) environmental conditions, it appears that the bulk of the albacore catch this season will be taken in waters south of San Francisco. However, the waters north of San Francisco are expected to yield a greater percentage of the catch than the long-term average. (The long-term average for the catch taken north of San Francisco is 36%.) It is estimated that between 25 to 35 million pounds will be caught by commercial boats in waters south of San Francisco, and between 15 to 22 million pounds in waters north of San Francisco (about 10 to 15 million pounds in Oregon). Sport boats operating in southern California waters should have very good fishing.

AVERAGE SEA SURFACE TEMPERATURE

The 11-year average (1960-70) of the optimum temperature zone for albacore for the July 1-15 period is shown in the shaded portion of Plate 1. The bulk of albacore are taken in waters of this temperature range. Prevailing weather during this period in 1971 will no doubt cause deviations from this average pattern which will influence the distribution of albacore. We will monitor the evolving temperature patterns in order to project the albacore distribution as the season develops.

RECENT TRENDS IN OCEANIC AND ATMOSPHERIC CONDITIONS

The latest available observational data indicate that sea surface temperatures along the U.S. west coast from Vancouver Island to the tip of Baja California and out to longitude 135° W are 2° (F) below average temperatures computed for the previous decade. These below-average conditions continue a pattern that has persisted since January 1971. The 60° isotherm, which normally begins a northward advance between 125° W and 135° W in May, appeared this year to get an early start and reverse the cool trend, judging by its displacement from the last part of April to the first part of May. But the momentum of early warming was short-lived, and the 60° isotherm was still well south of its normal location in the last half of May (Plate 2). These short-term events at the onset of the warming season are of scant assistance in projecting the probable distribution of sea temperature in mid-summer. Continued monitoring and careful interpretation, however, may lead to forewarning of changes in longer period trends.

In the central northeast Pacific, west of the California Current region, a tendency toward warmer-than-normal sea surface temperatures has persisted for several months. This condition was most pronounced in December 1970, at which time the warmest water, relative to normal, occurred west of longitude 165° W between latitudes 35° N and 50° N. Since then, the warmer-than-normal condition spread south and east and diminished in intensity. By May 1971, the largest departures from normal were centered northwest of Hawaii.

The evolution of atmospheric circulation over the eastern North Pacific in the winter and early spring of 1971 is revealed by the anomalous barometric pressure patterns. In January, a ridge of higher-than-normal pressure extended along a northern-south axis off the coast. Farther west, the pressure was below normal. The centers of above normal and below normal pressure gradually shifted around each other in a clockwise manner until, by March there was lower-than-normal pressure in the Gulf of Alaska and higher-than-normal pressure to the south at about latitude 35° N. Consequently, there were unusually strong winds blowing northward between longitudes 140° W and 155° W in January and February and eastward between latitudes 40° N and 55° N in March, April, and May. These circulation features were instrumental in diffusing the large pool of warm water already described.

The north-northwest winds along the coast also have been stronger-than-normal in recent months, inducing pulses of upwelling and strengthening the California Current along the U.S. and Baja California coasts. These effects helped maintain the cooler-than-normal surface temperatures along the coast and favor local biological enrichment for production of adequate tuna forage.

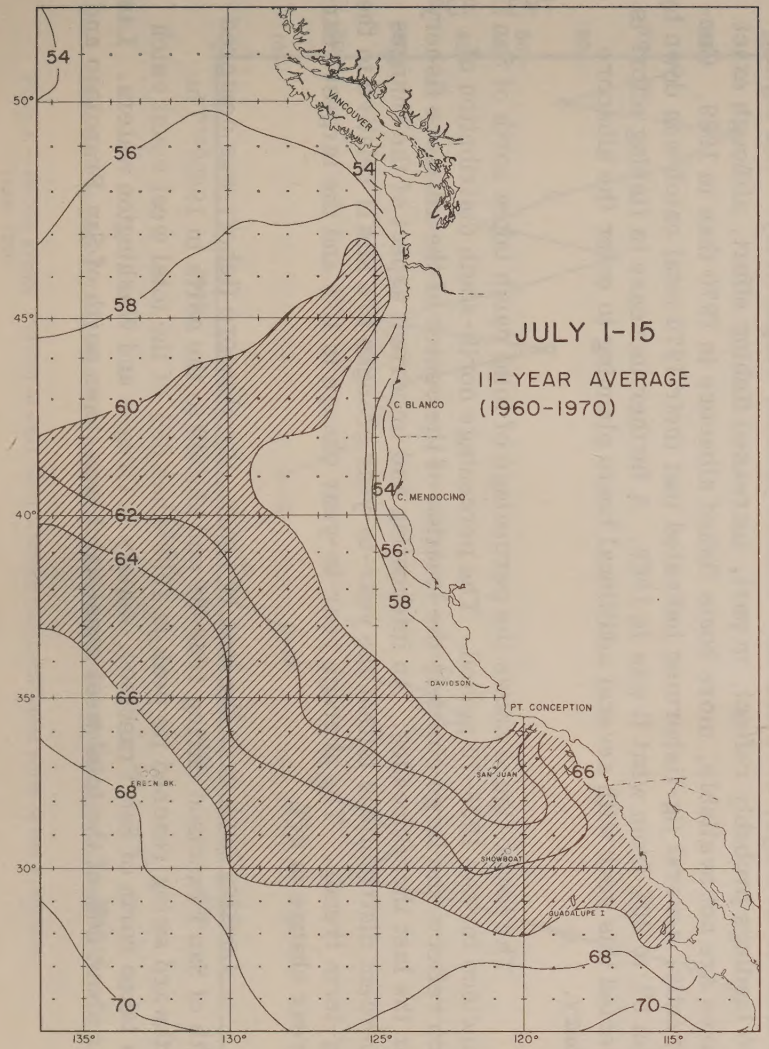


Plate 1. --Average sea surface temperature fields for the July 1-15 interval. Shaded zone delineates region where most of the albacore would be available under these conditions.

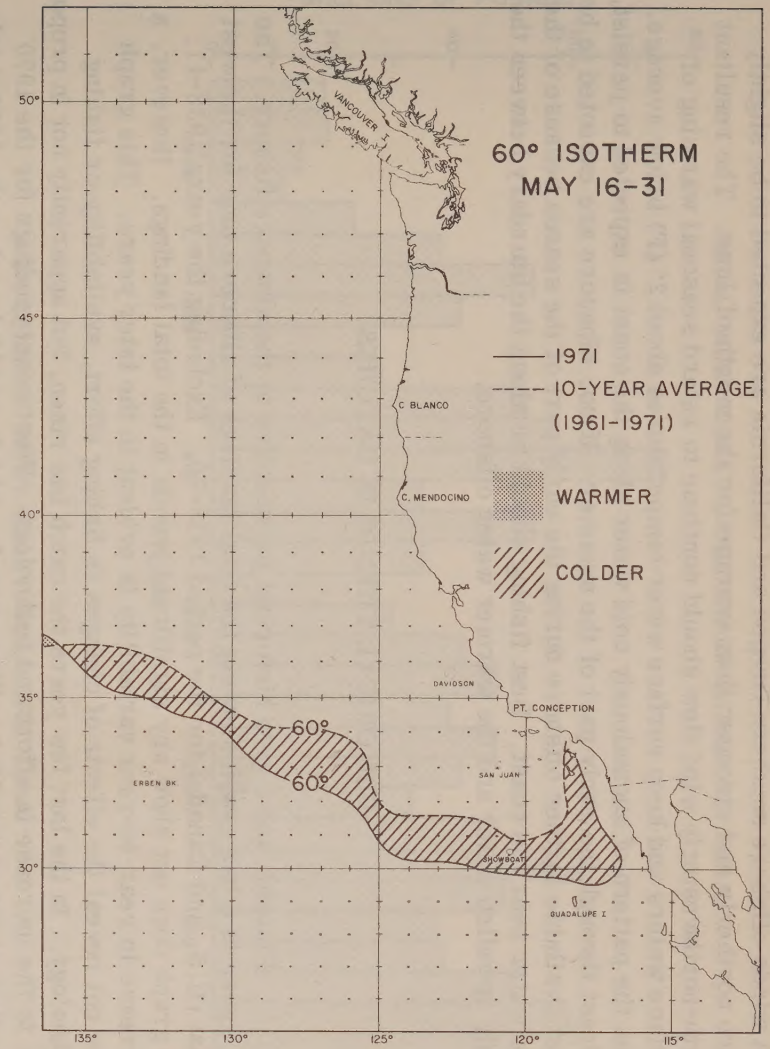


Plate 2. --Relation of position of May 16-31, 1971, 60° F limiting isotherm to long-term average position for the same interval.

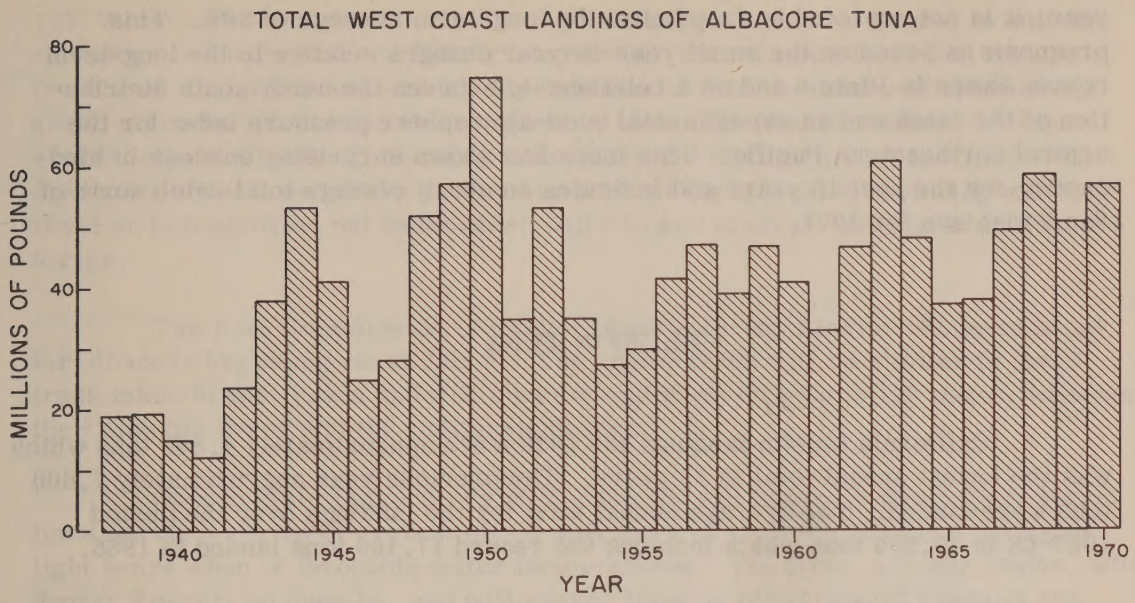
The Extended Forecast Division of the National Weather Service reports that winds offshore southern Oregon and California are expected to be slightly more northerly and stronger than average for the month of June. The resultant north-northwesterly wind flow should continue to retard seasonal warming of surface waters and keep surface water temperatures about 2° (F) below average. Thus the pattern of anomalously cold water along the coast is expected to persist, at least through the early part of the summer. If so, albacore are expected to be most available further offshore during the early part of the season because of the cold water near the coast. Best fishing should be along the boundary between the cold, upwelled water and the warmer water offshore.

HISTORICAL TRENDS IN CATCHES

Plates 3 and 4 give historical perspective to the albacore fishery. The top figure is a bar graph showing the total landings of albacore tuna for the west coast (U.S. and Canada) for the period 1938-70. Excluding the years 1938-41, the graph does not show any significant trends in the total landings. However, a decrease in year-to-year variability is evident in the later years. This graph does not reveal the effects of changes in fishing effort, availability or fishing technology. In the last few years the catch has risen, but apparently not in proportion to the increase in effort and technology. West coast landings for the 1970 albacore season were 57.5 million pounds, which was higher than the 1969 total and 1960-69 average, 50.5 and 45.7 million pounds, respectively. The higher 1970 landings probably reflect, in part, increased fishing effort, although exact figures are not available, more boats fished albacore in 1970 than in 1969. Concurrently, several jig-fishermen indicated that their 1970 total catch was down by about 5% to 20% from what it was in 1969. A further increase in fishing effort is expected this year with several additional boats planning to enter the albacore fishery.

The lower figure shows the percentage of total catch taken north of San Francisco for the 1938-70 period. The percentage north-south distribution of catch reflects the large shifts in the location of the center of the albacore fishery over the last three decades. An interesting and important aspect of the changes in percent distributions is that the year-to-year changes are small relative to the long-term trends. The average year-to-year change is 13% and the largest year-to-year change is 27%

Looking back over the last 10 years, the albacore fishery was centered south of San Francisco during 1960-64 and shifted to the north in 1965. The northward swing reached its peak in 1968 when 85% of the total west coast catch was taken north of San Francisco, mainly in Oregon and Washington waters. Last year about 65% of the total west coast catch was taken north of San Francisco and



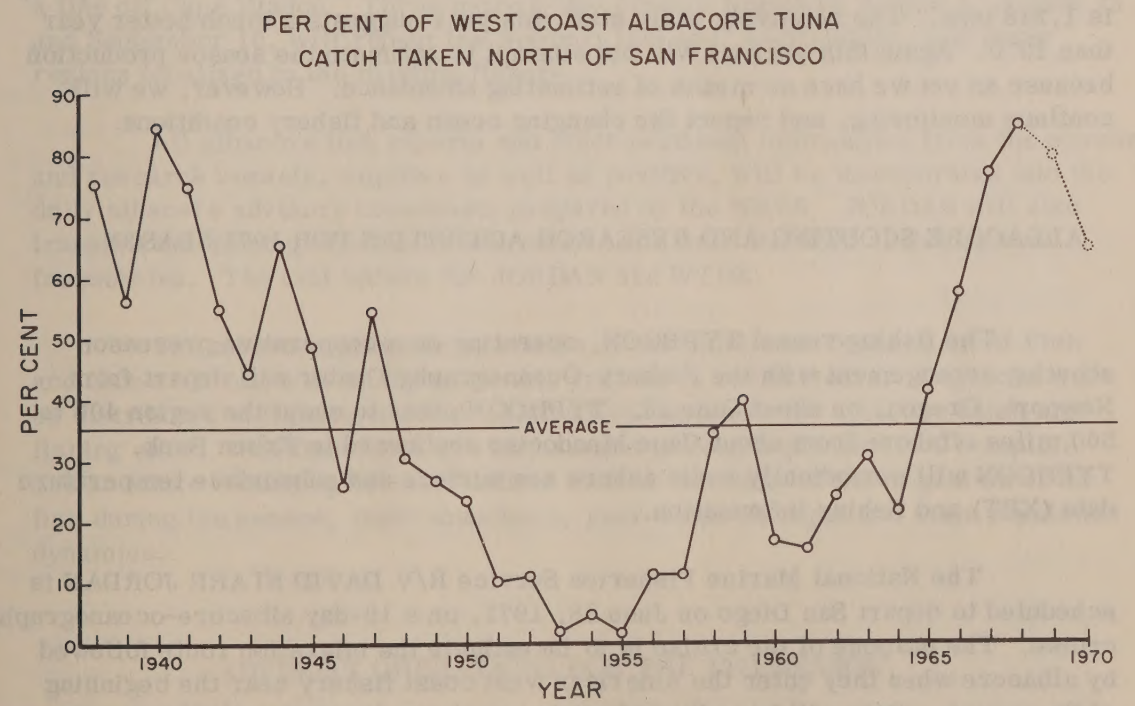


Plate 3. --Top graph: Total west coast landings of albacore tuna in millions of pounds, 1938-1970.

Plate 4. --Bottom graph: Percent of west coast albacore tuna catch taken north of San Francisco, 1938-1970.

it appears that the fishery has begun a swing back toward the south. While the percentage of total catch taken north of San Francisco is likely to be lower this year, it is not expected to drop below the long-term average of 36%. This prognosis is based on the small year-to-year changes relative to the long-term trends shown in Plate 4 and on a relationship between the north-south distribution of the catch and an experimental wind-atmosphere pressure index for the central northeastern Pacific. This index has shown surprising success in hindcasting for the past 15 years and indicates an above average total catch north of San Francisco for 1971.

BLUEFIN TUNA

California bluefin landings for 1970 were approximately 4,800 tons which was the lowest annual total in 17 years. The previous year approximately 7,600 tons were landed. The average annual total for the landings over the period 1957-68 is 10,900 tons which includes the record 17,400 tons landed in 1966.

In 1970, the season started late and ended early; the first major catches occurred in the fourth week of June. This year 360 tons were taken in the second week of May and 648 tons in the third week. Total reported as of May 31, is 1,248 tons. The relatively early start this year suggests a much better year than 1970. Again this year we will not attempt to estimate the season production because as yet we have no means of estimating abundance. However, we will continue monitoring, and report the changing ocean and fishery conditions.

ALBACORE SCOUTING AND RESEARCH ACTIVITIES FOR 1971 SEASON

The fishing vessel TYPHOON, operating on a cooperative preseason scouting arrangement with the Fishery-Oceanography Center will depart from Newport, Oregon, on about June 15. TYPHOON plans to scout the region 400 to 500 miles offshore from about Cape Mendocino southward to Erben Bank. TYPHOON will periodically radio ashore sea surface and subsurface temperature data (XBT) and fishing information.

The National Marine Fisheries Service R/V DAVID STARR JORDAN is scheduled to depart San Diego on June 28, 1971, on a 19-day albacore-oceanography cruise. The purpose of the cruise is to investigate the migration route followed by albacore when they enter the American west coast fishery near the beginning of the season. Data will be collected on the cruise to determine if albacore migrate

into the American fishery along the boundary of the transition zone between the north Pacific and central Pacific waters. The study area is planned along the 135° W meridian between 33° N and 43° N latitude, but may be altered to suit the changing environmental and fishing conditions. Cruise operations will include trolling of 12 jiglines and making observations of the life history of albacore by study of stomach contents, livers, gonads, and other vital statistics. Oceanographic observations will be made to measure the distribution of environmental characteristics associated with the migration of the albacore, including midwater trawl and zooplankton net hauls which will be used to obtain estimates of albacore forage.

The Fish Commission of Oregon plans a 10-day charter cruise to scout for albacore beginning about July 1. The cruise track will be similar to the track taken in past years and will cover a region off Oregon to 120 miles, between the Columbia River and the California border.

Oregon State University's R/V CAYUSE will occupy hydrographic survey lines during a series of cruises off Oregon and will troll for albacore during daylight hours when in favorable water temperatures. The first, a 6-day cruise, will depart Newport on June 14, and will survey lines to 165 miles off Newport and Coos Bay. A 7-day cruise is scheduled beginning July 8 and will repeat the Newport and Coos Bay lines, extending them to nearly 200 miles, and may add a line off Cape Blanco. Three more 6-day cruises beginning August 4, August 23, and September 10, will repeat the Newport line and, additionally, will cover regions localized to the existing fishery.

All albacore fish reports and other pertinent information from the scouting and research vessels, negative as well as positive, will be incorporated into the daily albacore advisory broadcasts prepared by the NMFS. JORDAN will also transmit her fishing reports to interested boats over the normal fishing boat frequencies. The call letters for JORDAN are WTDK.

The albacore program operation of the California Department of Fish and Game (CF&G) will be the same this year as in recent years. Logbooks will be distributed to fishermen from which CF&G monitors the albacore catch and fishing effort. All fishermen are encouraged to keep logbooks since complete and accurate recording of catch data is vital to the study of the migration of the fish during the season, their abundance, year-class strength and their population dynamics.

ADVISORY OPERATIONS FOR THE 1971 SEASON

The Fishery-Oceanography Center of the National Marine Fisheries Service in addition to the above forecast for the 1971 season will issue albacore advisory information throughout the season. The advisory information will

include sea surface temperature charts, narrative albacore fish bulletins, and daily broadcasts of albacore fishing information over marine radio bands.

The albacore fish bulletins will be issued twice each month from July 1 until the season ends, in conjunction with 15-day sea surface temperature charts. The 15-day sea surface temperature charts, which are now issued year round, cover the area roughly between central Baja California and Vancouver Island out to 135° W. The bulletins will include short-term projections of albacore distribution and locations of productive fishing areas, information on oceanographic and atmospheric conditions, and other information as is appropriate.

This publication, Fishing Information, appears monthly and contains 1) charts of sea surface temperature for the North Pacific and eastern tropical Pacific, 2) charts of winds and pressures for the eastern North Pacific, 3) a narrative describing pertinent temperature conditions, and 4) fishery advisory information. All the NMFS fishery advisory materials are mailed to fishermen upon request and are bulk-mailed to fish buyers and processors for further dissemination to fishermen.

Daily broadcasts of albacore fishing information will also be prepared by the NMFS and will be transmitted over marine radio bands again this year. The broadcasts will be made twice daily on weekdays and once on Saturday mornings from July 1 to October 31, or until the albacore season ends. The broadcasts will include the latest albacore fishing information obtained from research vessels, cooperating fishing vessels, and unloading station operators. Highlights will include location of active centers of fishing, typical fishing scores, size of fish, sea surface temperature and mixed layer depth information when available, and other information as appropriate. Sport boat activity will also be included. A weather and sea state summary tailored for fishermen's needs will also be given including large-scale weather features and long range outlook, regional wind, weather, and sea state conditions outside 40 miles, and storm development.

In addition, each 15-days the broadcast includes map coordinates for the 15-day average position of the 60 and 64° F isotherms for the region east of 130° W longitude and between 25° N and 50° N latitude. Examples of the encoded message and a plot of the coordinates are given at the end of this section.

Nearly coast-wide reception of the albacore fishery advisory broadcasts will be available this year as the result of the excellent cooperation of the Marine Minerals Technology Center (MMTC) at Tiburon, California, and the Pacific Northwest Bell Telephone and Telegraph Company. In addition to being transmitted by radio station WWD, which is licensed to the NMFS and located on the Scripps Institution of Oceanography (SIO) campus at La Jolla, California, the broadcasts will be made by radio station KMY at Tiburon and the Astoria Marine Operator, KFX. Attempts are also in progress to have a broadcast outlet established in Eureka, California.

WWD will broadcast on double sideband voice on frequency 4409.4 kHz and on single sideband on frequency 8791.0 kHz at 0600 and 1945 PDT.

KMY will broadcast on double sideband voice on frequency 4409.4 kHz at 0815 and 1545, weekdays only.

Astoria Marine Operator, KFX will broadcast on frequency 2598 kHz at 0600 and 1945 PDT.

The success of the albacore advisory program depends on the input of timely, first-hand information from fishermen at sea, as well as from dock operators and processors. Fishermen are encouraged to report oceanographic, weather and fishing information. As a channel of communication for such information radio station WWD will operate the following voice frequencies and schedules. WWD is now a duplex station and will transmit on one frequency and receive on another.

Double sideband

WWD transmit	WWD receive
4409.4	4112.2

Single sideband

WWD transmit	WWD receive
4410.8 kHz	4112.2
8791.0	8257.0
13148.9	12369.9

Hours of operation are 0400-0100 local time, 7 days per week, including holidays.

The Fishery-Oceanography Center will also accept collect calls from fishermen at sea to report oceanographic, weather, and fishing information.

The telephone number is (714) 453-2820.

For further details concerning the National Marine Fisheries Service Albacore Advisory Information, please contact:

Director
National Marine Fisheries Service
Fishery-Oceanography Center
P.O. Box 271
La Jolla, California 92037

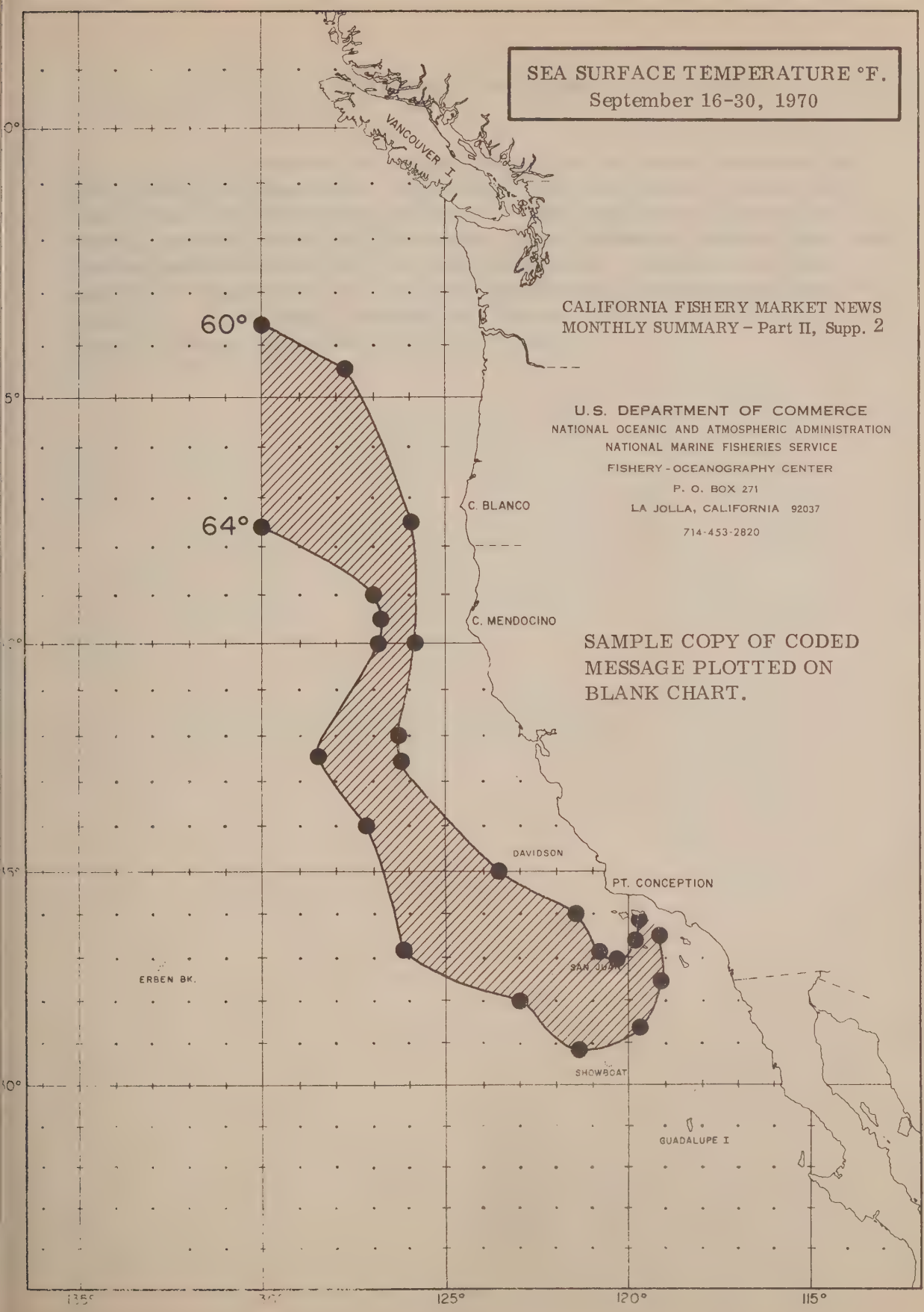
SAMPLE OF CODED MESSAGE FOR POSITION OF 60° AND 64° F ISOTHERMS GIVEN IN DAILY BROADCASTS.

The first three numbers are latitude in degrees and tenths. Last four numbers are longitude in degrees and tenths.

Position of 60 degree isotherm	Position of 64 degree isotherm
4631300	4231300
4551278	4101270
4251260	4051268
4001258	4001269
3801263	3761285
3741262	3601272
3501236	3321262
3401215	3201230
3311208	3081214
3291203	3131197
3331198	3241191
3381197	3351192

The above message, when decoded and plotted as in the following example, provides the fisherman at sea with a current analysis of the 60-64° F temperature zone.

Staff, Fishery-Oceanography Group
R. Michael Laurs, Leader


SEA SURFACE TEMPERATURE °F.
September 16-30, 1970
CALIFORNIA FISHERY MARKET NEWS
MONTHLY SUMMARY – Part II, Supp. 2
U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL MARINE FISHERIES SERVICE
FISHERY-OCEANOGRAPHY CENTER
P. O. BOX 271
LA JOLLA, CALIFORNIA 92037
714-453-2820
SAMPLE COPY OF CODED MESSAGE PLOTTED ON BLANK CHART.
VANCOUVER I.
60°
64°
C. BLANCO
C. MENDOCINO
DAVIDSON
PT. CONCEPTION
ERBEN BK.
SAN JUAN
SHOWBOAT
GUADALUPE I
125°
120°
115°

COMMERCIAL FISHERMAN'S DIRECTORY AVAILABLE

A useful handbook for fishermen fishing off the Pacific Northwest coast, the "Commercial Fisherman's Directory of Emergency Service," is now available. This pocket-size publication gives a listing of fish buyers and canners, medical facilities, motor and general boat repair companies, marine supply units, marine service stations, etc., for ports from Eureka, California, and north. A copy of this Pacific Sea Grant Advisory Program publication can be obtained free on request to H. M. Dail, University of California Cooperative Extension, 1422 South 10th Street, Richmond, California 94804.

NARRATIVE DESCRIPTION OF OCEAN TEMPERATURE CONDITIONS

Northeastern Pacific

Temperature conditions in the northeastern Pacific in May 1971 are described in the Temperate Tuna Forecast for 1971, section titled "Recent Trends in Oceanic and Atmospheric Conditions."

Eastern Tropical Pacific

Westward transport of cold upwelled coastal water toward the Galapagos Islands became re-established this month, after an apparent lapse in April, causing temperatures to drop below normal. West of longitude 100° W, sea surface temperatures along the equator were mostly above normal, ending the cold condition which characterized previous months. Just north of the equator, however, was a relatively cool area between longitudes 90° W and 110° W with temperatures less than 78° (F), representing negative deviations of 2-4° (F) from the long-term means. This appears to be a significant change from the previous month when temperatures were above normal at the location of the maximum negative departures from normal in May.

Temperatures along the Central American coast continued to be cooler than normal, particularly from Acapulco northward. This area of anomalously cool water also extended southwestward approximately along the 10° N-20° N latitude zone.

Acknowledgements

The following organizations and stations contributed data for the May charts:

Hopkins Marine Station, Pacific Grove, California, J. P. Balesteri
Instituto Hidrografico de la Armada, Valparaiso, Chile
Inter-American Geodetic Survey by L. Peren at Puerto Armuelles, Panama; P. Lopez at Talara, Peru; P. Mansilla at San Juan Peru
Kelco Company, San Diego, California
Living Marine Resources Inc., San Diego, California
National Oceanic and Atmospheric Administration
National Marine Fisheries Service, Biological Laboratories La Jolla, California; Honolulu, Hawaii; Seattle, Washington
National Weather Service, San Diego, California
National Ocean Survey, Pacific Marine Center, Seattle, Washington
Pacific Environment Institute, Fisheries Research Board of Canada, West Vancouver, British Columbia, by H. J. Hollister from observations; K. D. Godin at Cape St. James Light; Lilly Collins at Kains Island Lightstation; O. A. Edwards at Amphitrite Point Light
Pacific Missile Range, Range Operations Department, Geophysics Division, Point Mugu, California
Scripps Institution of Oceanography, La Jolla, California, by Margaret Robinson
Scripps Institution of Oceanography Research Vessel ALEXANDER AGASSIZ
U.S. Naval Weather Service, Fleet Numerical Weather Central, Monterey, California

Charts

Figure 1. -- Mean sea surface temperature, eastern north Pacific Ocean. Squares show temperatures at weather ship stations. Numerals on shore are temperatures at coastal and lightship stations.

Figure 2. -- Mean sea surface temperature chart, western north Pacific Ocean.

Figure 3. -- Deviation of sea surface temperatures, eastern north Pacific Ocean from long term charts of H.O. 225. Hatched areas are colder in 1971.

Figure 4. -- Deviation of sea surface temperatures, eastern north Pacific Ocean from those of May 1970. Hatched areas are colder in 1971.

Figure 5. -- Mean sea surface temperature, eastern tropical Pacific Ocean. Numerals on shore are temperatures at coastal stations.

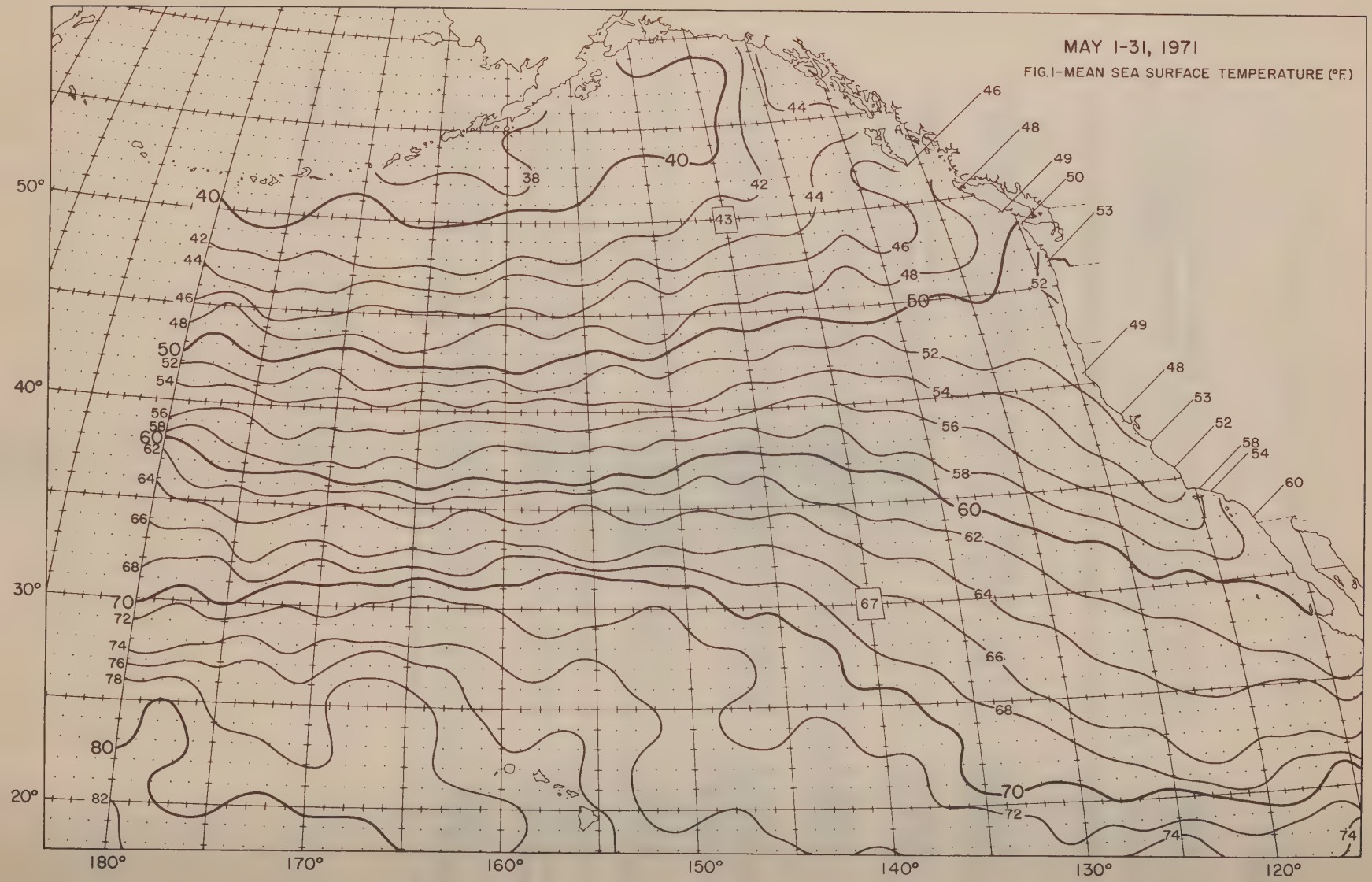
Figure 6. -- Deviation of sea surface temperatures, eastern tropical Pacific Ocean from long term charts of H. O. 225 and NAVOCEANO sp-123. Shaded areas are colder in 1971.

Figure 7. -- Deviation of sea surface temperatures, eastern tropical Pacific Ocean from those of May 1970. Shaded areas are colder in 1971.

Figure 8. -- 11-year mean (1961-1971) observed sea level values of barometric pressure (millibars), resultant wind direction (degrees true), resultant wind speed (knots), and average wind speed (knots) regardless of direction.

Figure 9. -- Observed sea level values of barometric pressure (millibars), resultant wind direction (degrees true), resultant wind speed (knots), and average wind speed (knots) regardless of direction.

James A. Renner, Fishery Biologist
Kenneth S. Raymond, Scientific Illustrator
June 9, 1971


MAY 1-31, 1971
FIG.1-MEAN SEA SURFACE TEMPERATURE (°F)
50°
40°
30°
20°
180°
170°
160°
150°
140°
130°
120°
38
40
42
43
44
46
48
49
50
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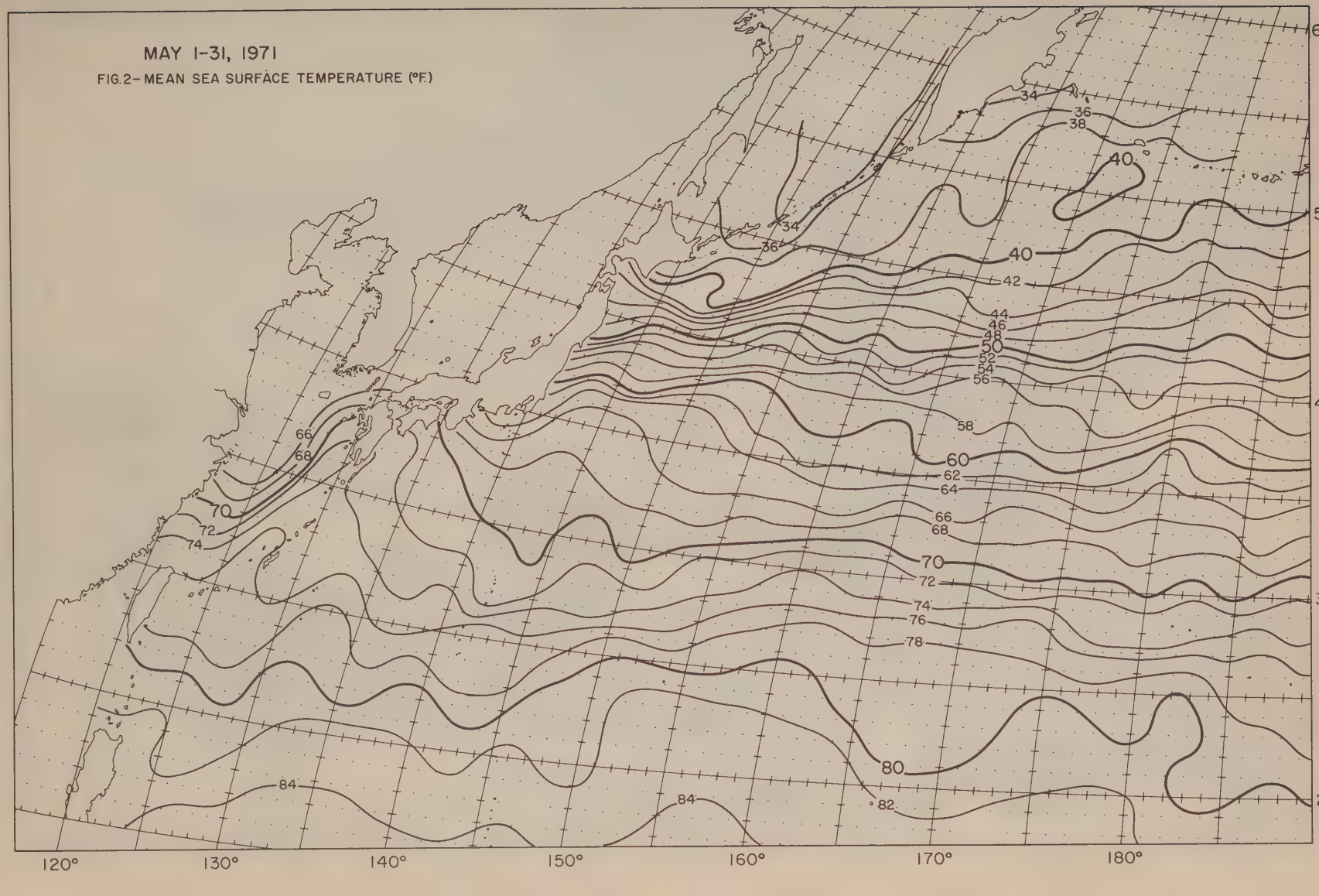
MAY 1-31, 1971
FIG.2- MEAN SEA SURFACE TEMPERATURE (°F.)
60°
50°
40°
30°
20°
120°
130°
140°
150°
160°
170°
180°
34
36
38
40
34
36
40
42
44
46
48
50
52
54
56
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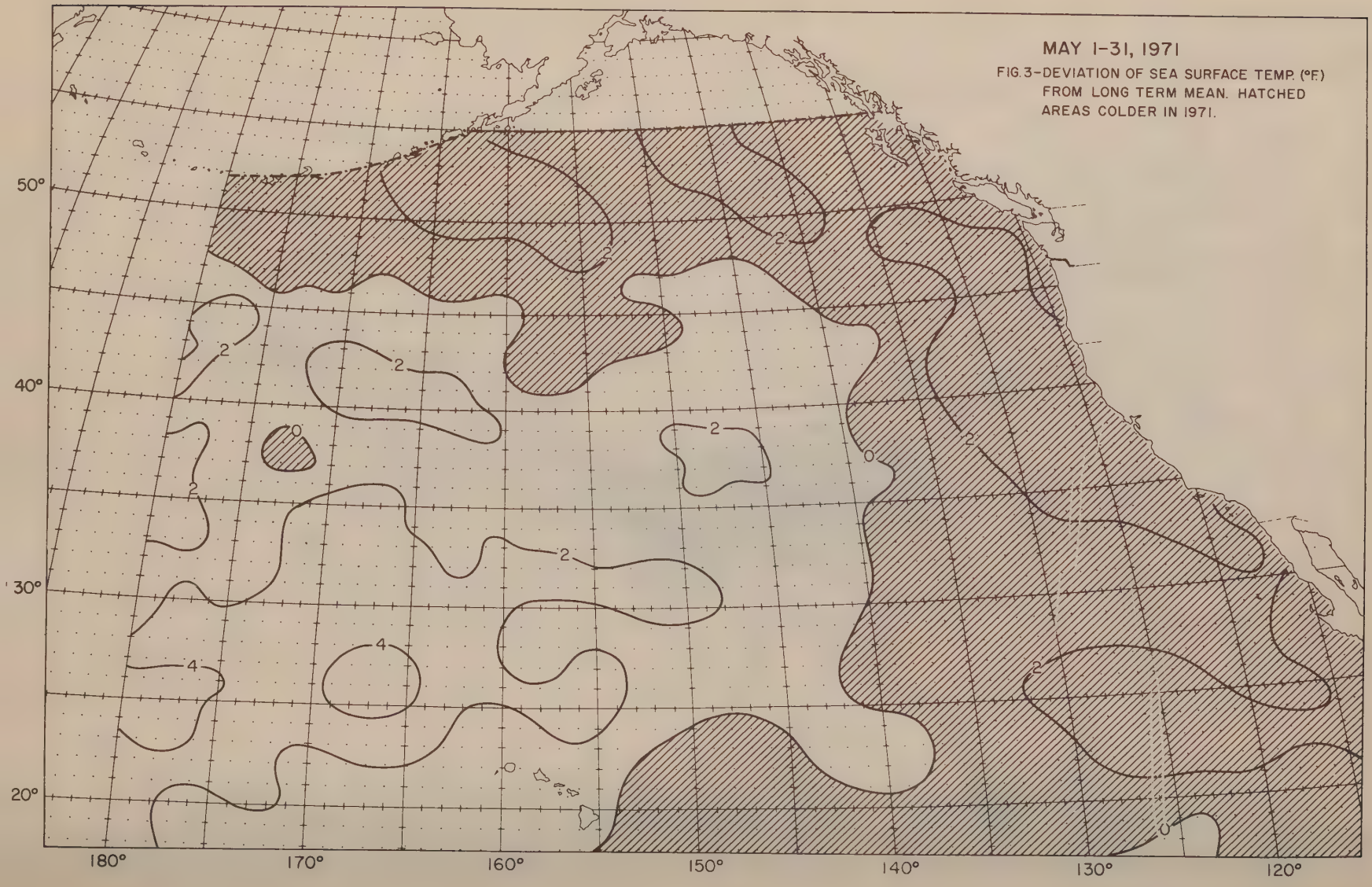
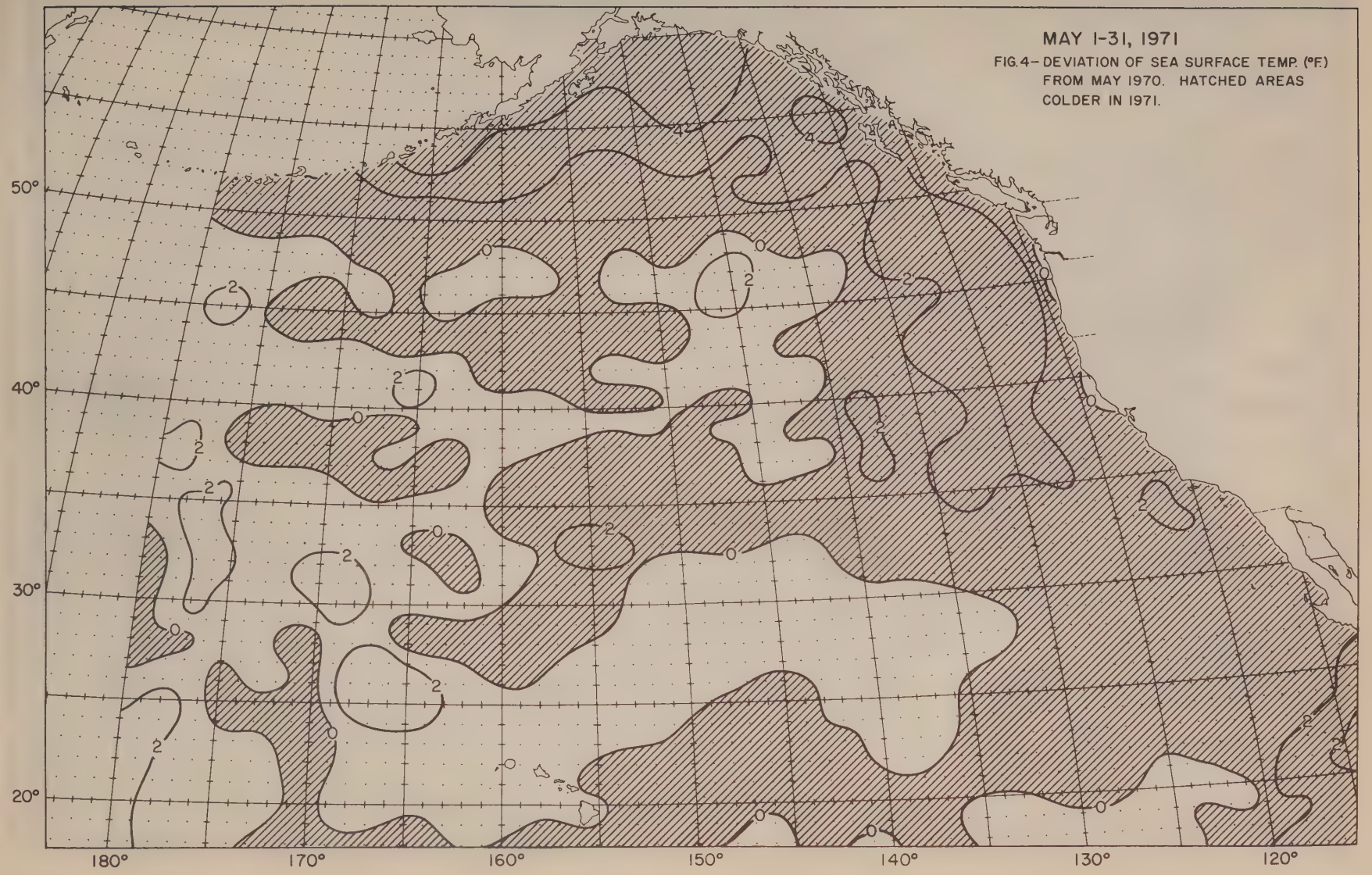
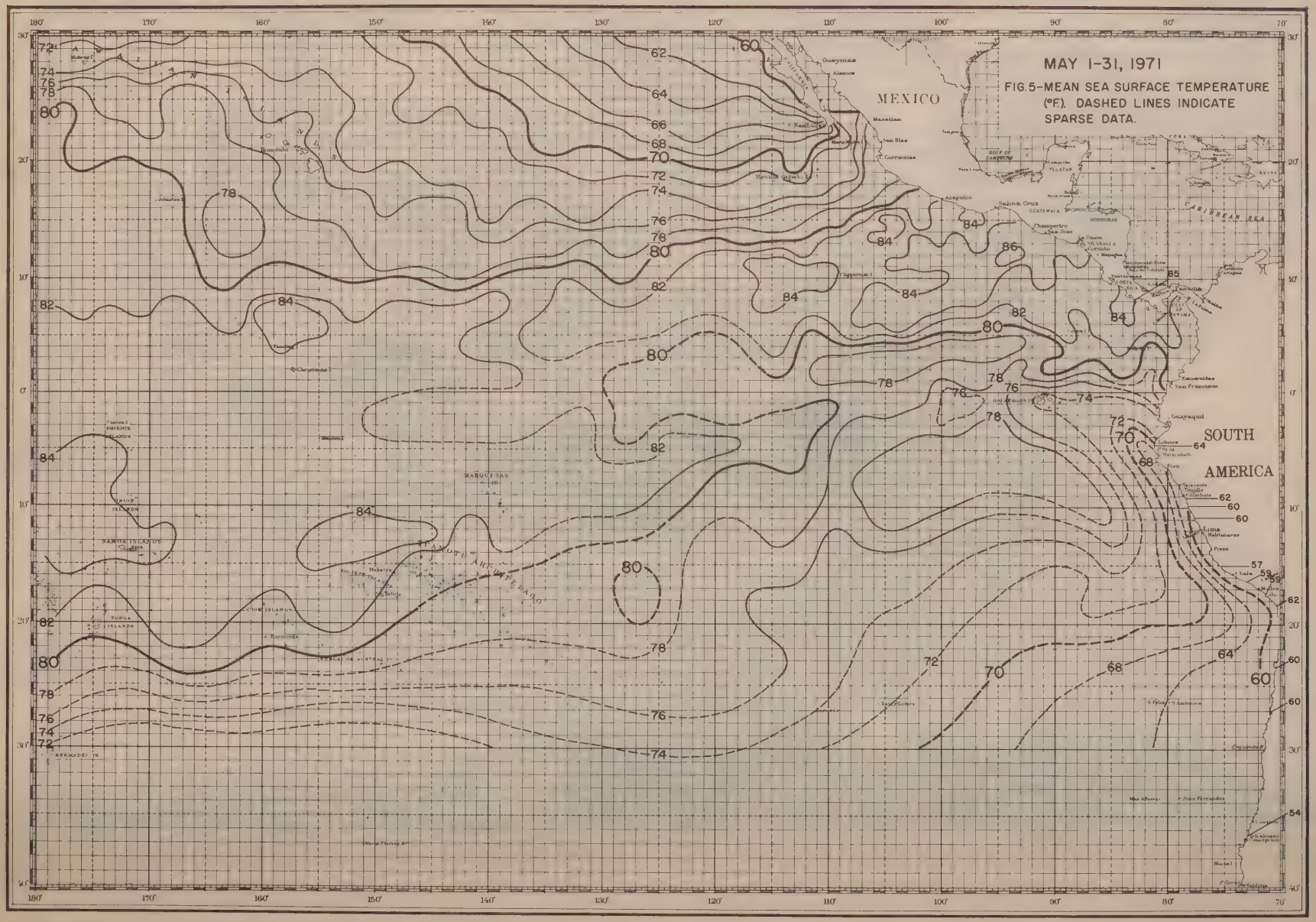
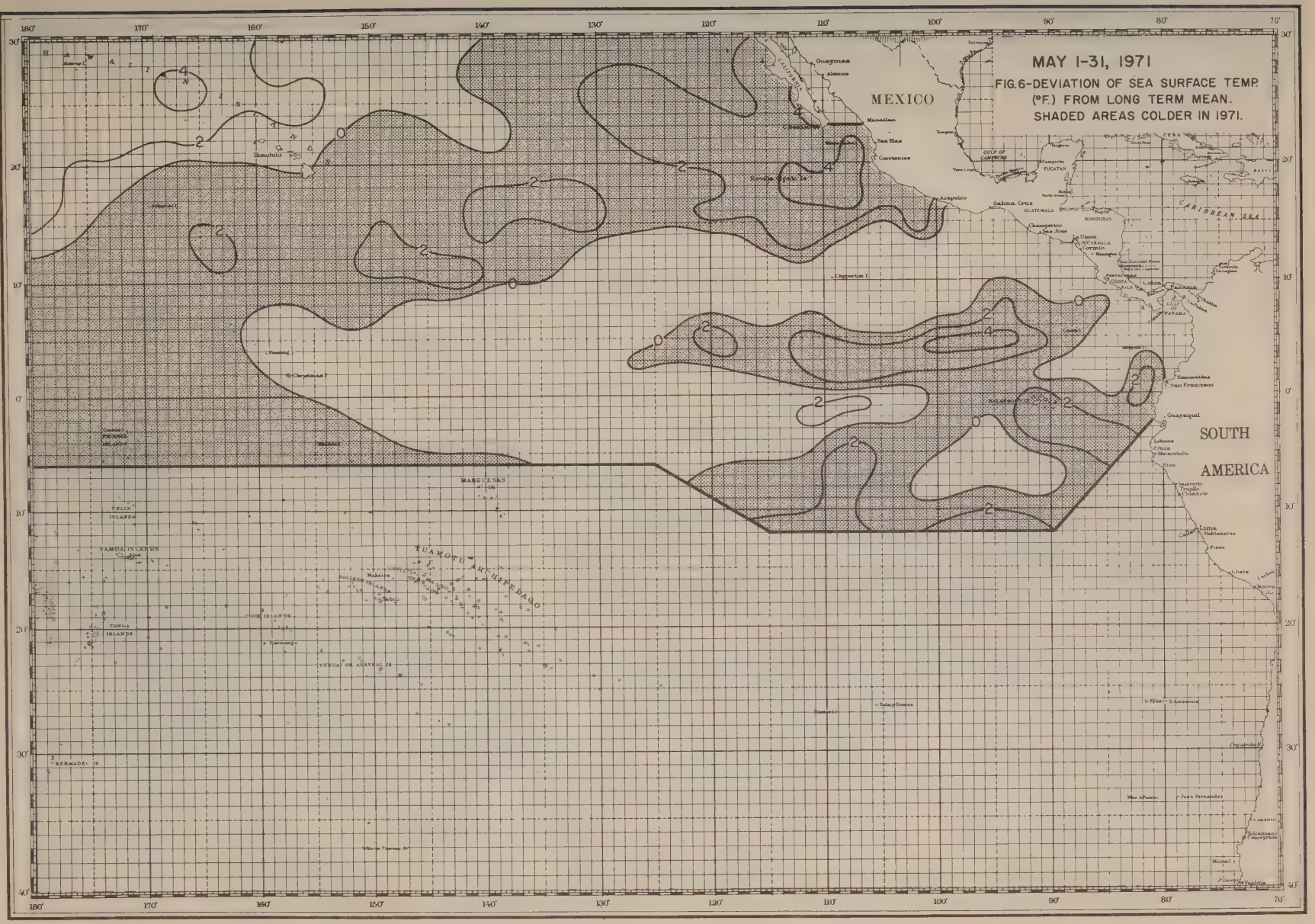
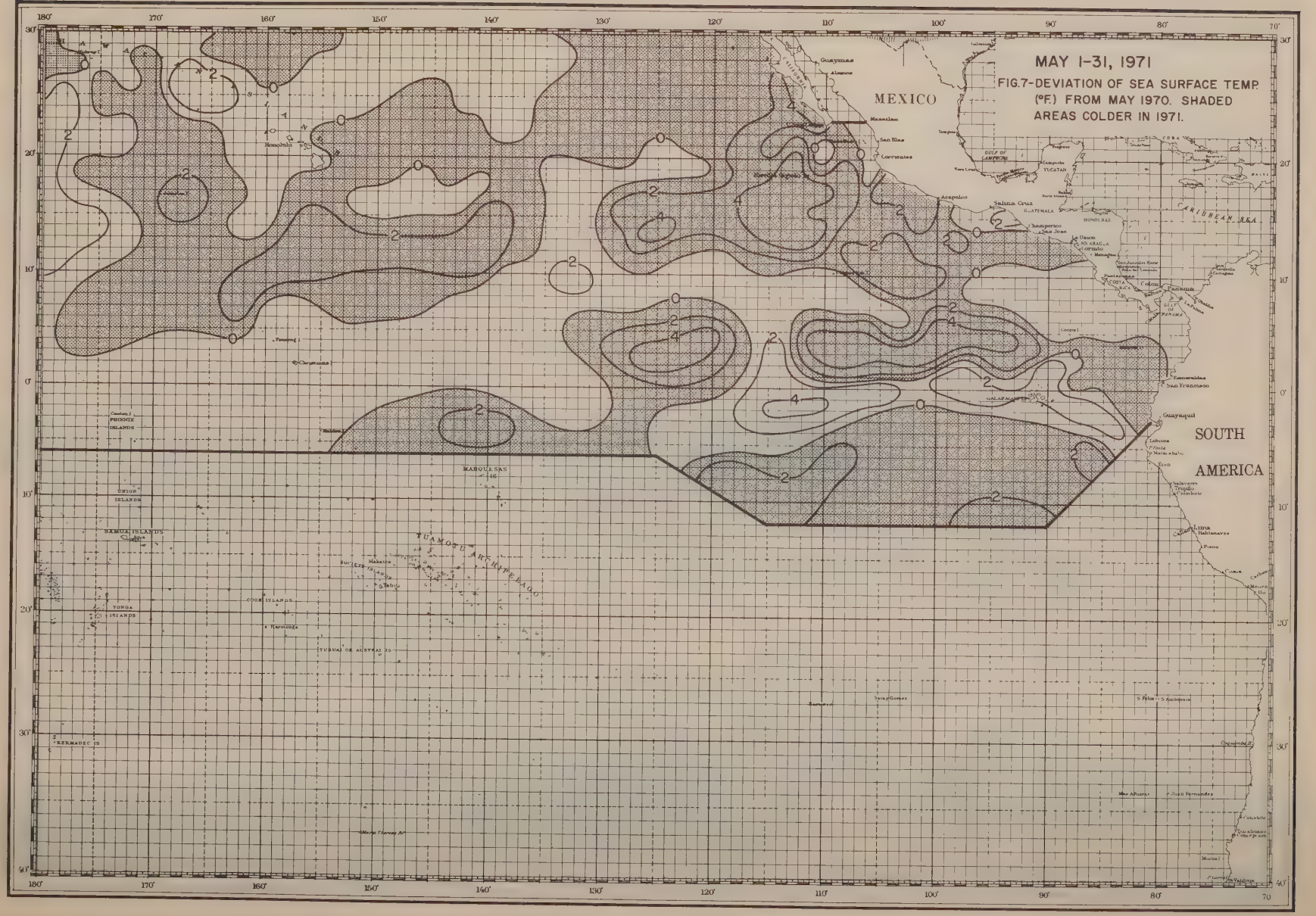
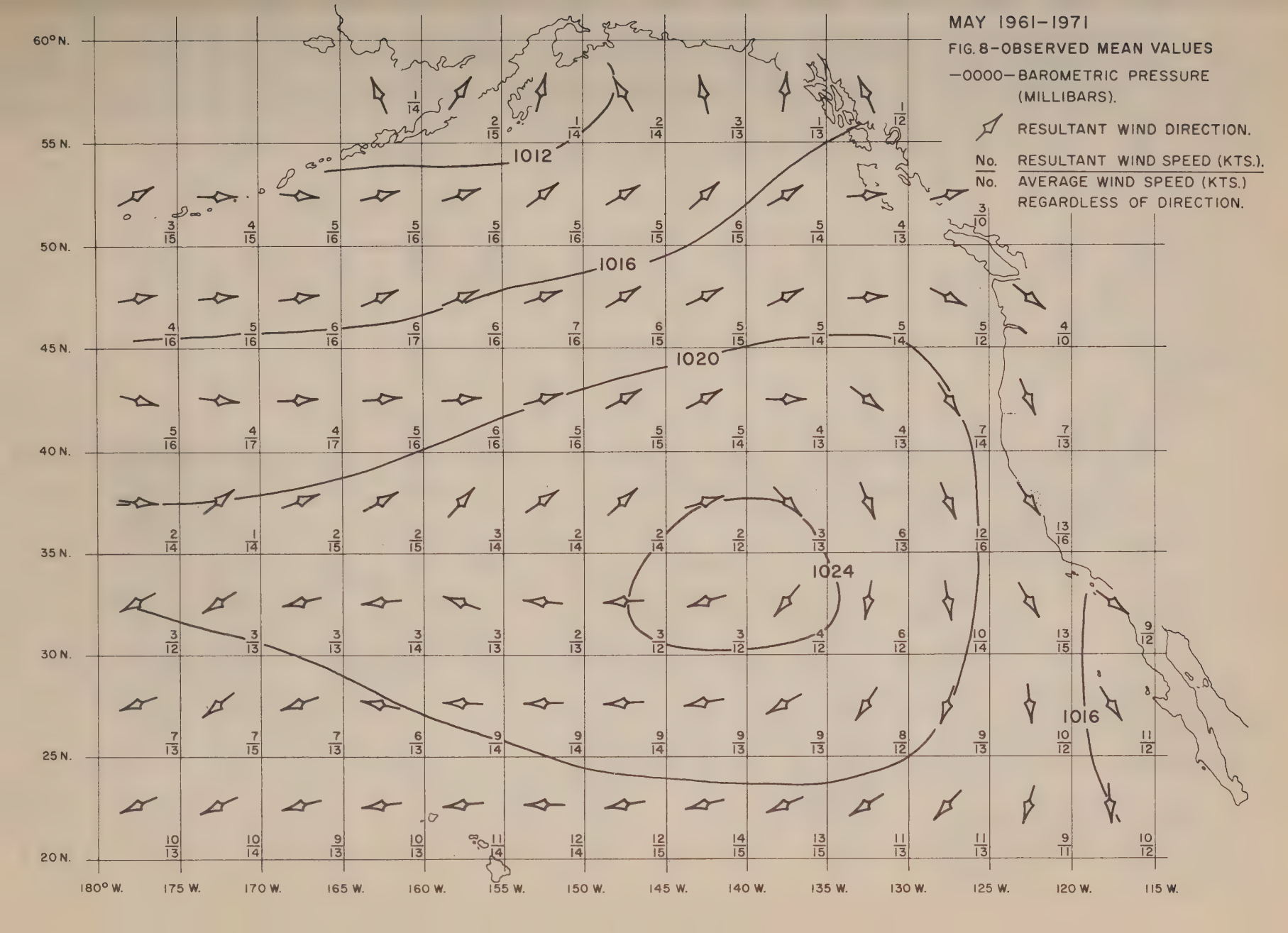

MAY 1-31, 1971
FIG. 3-DEVIATION OF SEA SURFACE TEMP. (°F.) FROM LONG TERM MEAN. HATCHED AREAS COLDER IN 1971.
50°
40°
30°
20°
180°
170°
160°
150°
140°
130°
120°
2
0
4

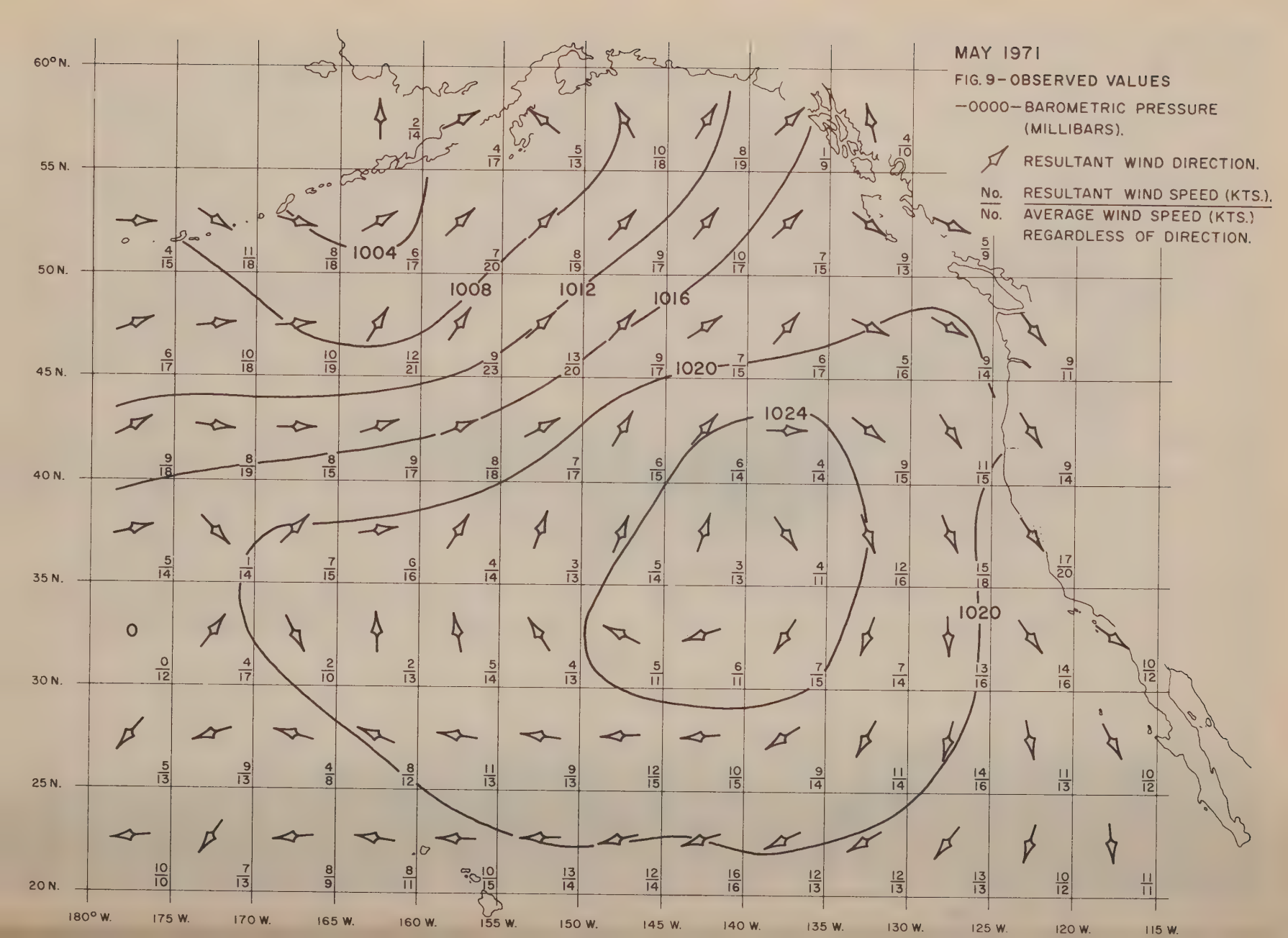

MAY 1-31, 1971
FIG. 4 – DEVIATION OF SEA SURFACE TEMP. (°F.) FROM MAY 1970. HATCHED AREAS COLDER IN 1971.
50°
40°
30°
20°
180°
170°
160°
150°
140°
130°
120°

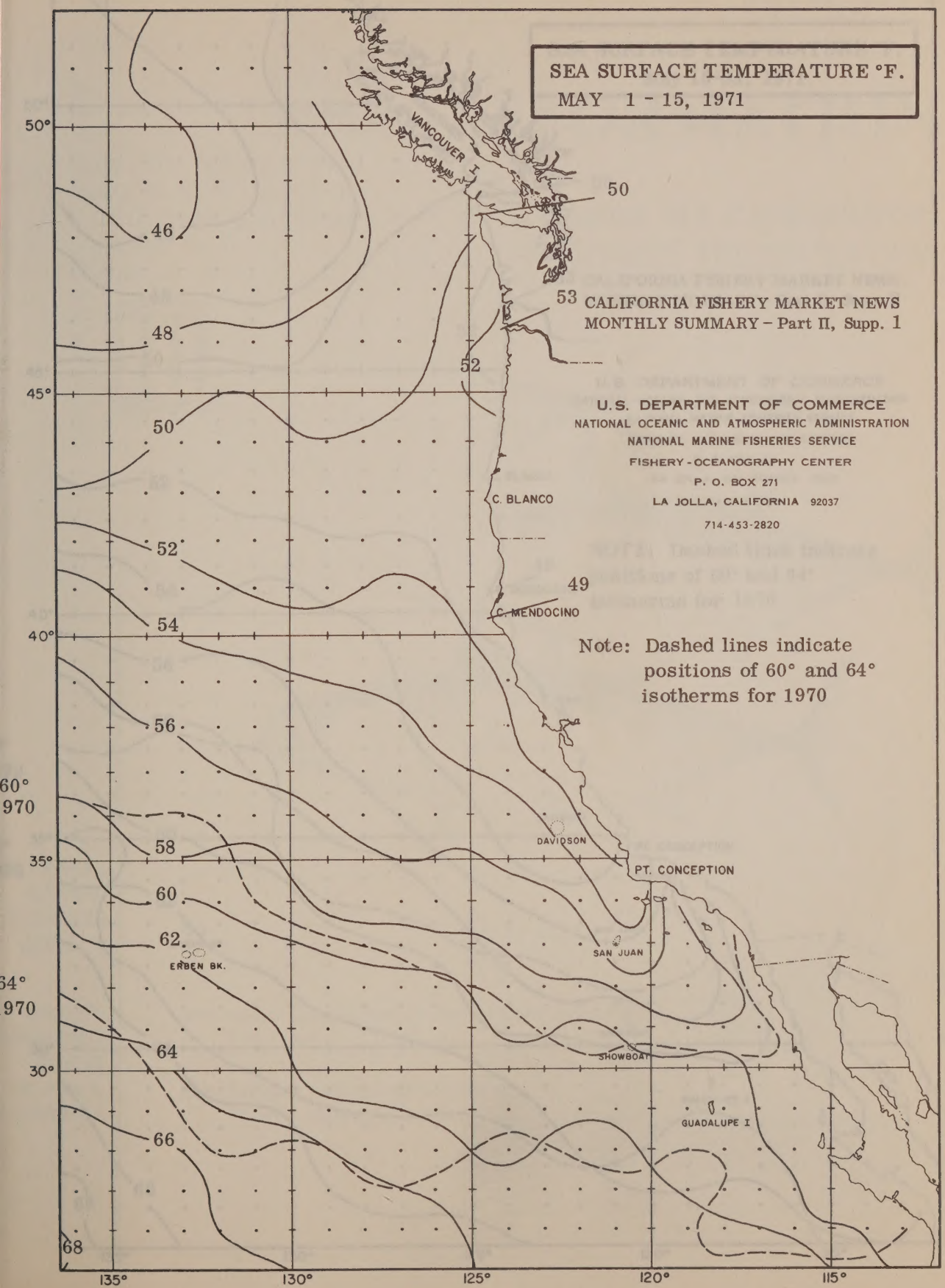

MAY 1-31, 1971
FIG. 5-MEAN SEA SURFACE TEMPERATURE (°F). DASHED LINES INDICATE SPARSE DATA.
MEXICO
SOUTH AMERICA
CARIBBEAN SEA
GULF OF CALIFORNIA
HONDURAS
GUATEMALA
COSTA RICA
PANAMA
MARQUESAS
SAMOA ISLANDS
PHOENIX ISLANDS
UNION ISLANDS
TOKELAU ISLANDS
SOUTH EQUATORIAL CURRENT
Guaymas
Mazatlan
San Blas
Acapulco
Salina Cruz
Champerico
Corinto
Panama
Esmeraldas
Guayaquil
Lima
Callao
Paita
Pisco
Mollendo
Arica
Iquique
Antofagasta
Valparaiso
Juan Fernandez
Easter I.
Galapagos Is.
Clipperton I.
Socorro I.
Revillagigedo Is.
Malpelo I.
Cocos I.
Hawaiian Is.
Honolulu
Johnston I.
Palmyra I.
Christmas I.
Fanning I.
Tahiti
Bermuda

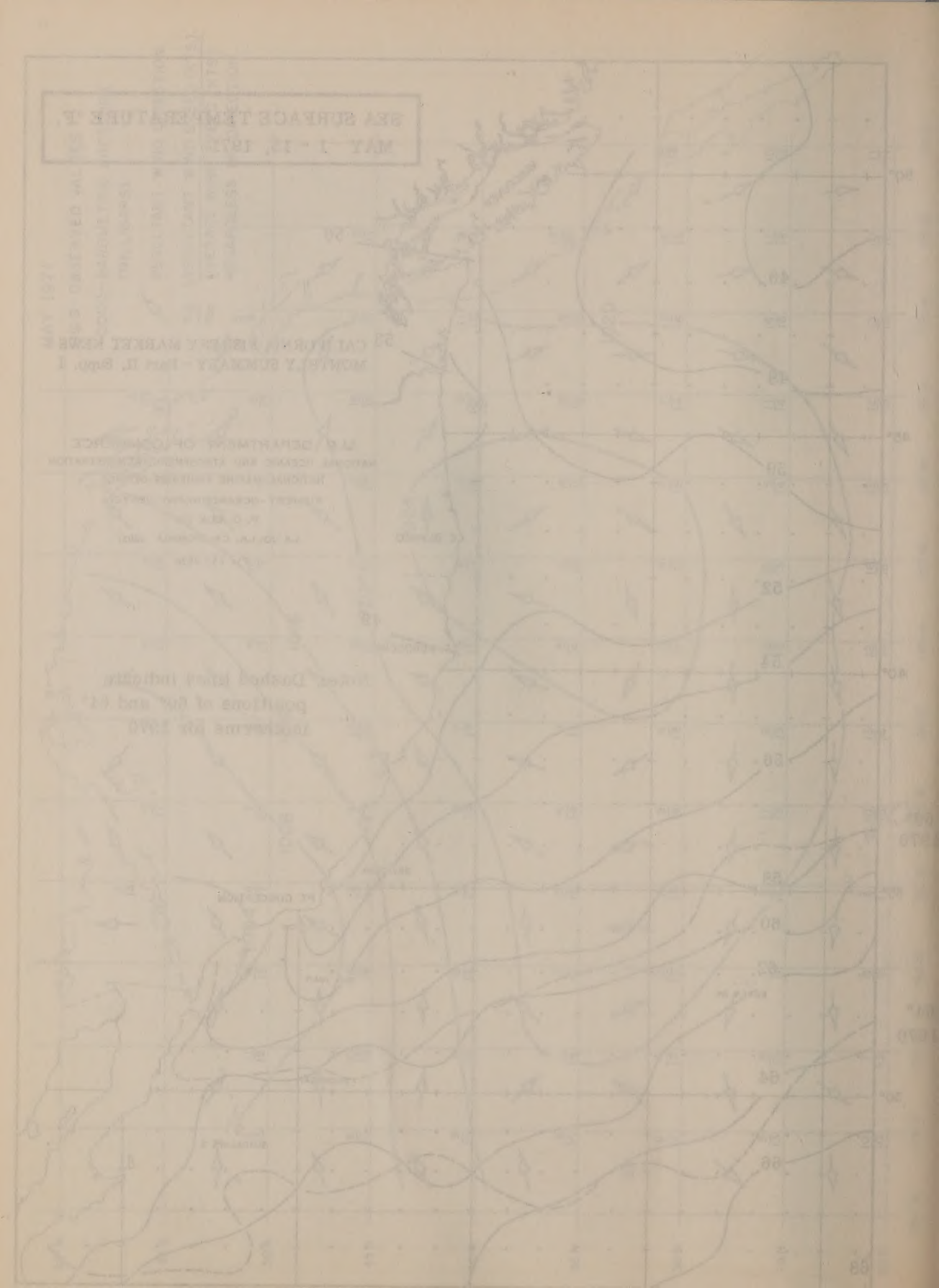

MAY 1-31, 1971
FIG.6-DEVIATION OF SEA SURFACE TEMP. (°F.) FROM LONG TERM MEAN.
SHADED AREAS COLDER IN 1971.
MEXICO
SOUTH AMERICA
CARIBBEAN SEA
HAWAIIAN ISLANDS
MARQUESAS
TUAMOTU ARCHIPELAGO
SAMOA ISLANDS
COOK ISLANDS
TONGA ISLANDS
GALAPAGOS
Honolulu
Acapulco
Salina Cruz
Guayaquil
Lima
Callao
Panama
Colon
Easter I
Pitcairn I
Clipperton I
Cocos I
Malpelo I
Juan Fernandez
Mocha I
Tubuai Is
Raivavae
Rapa
Mangareva
Pitcairn
Henderson
Ducie I
Oeno I
Easter
Sala y Gomez
Nazca Plateau
Chile Rise
Peru Basin
Chile Basin
Nazca Ridge
Carnegie Ridge
Galapagos Rise
Galapagos Spreading Center
Cocos Ridge
Panama Basin
Costa Rica Rift
Middle America Trench
Peru-Chile Trench
Tehuantepec Ridge
Clarion Fracture Zone
Clipperton Fracture Zone
Molokai Fracture Zone
Murray Fracture Zone
Pioneer Fracture Zone
Mendocino Fracture Zone
Gulf of California
Gulf of Panama
Gulf of Campeche
Yucatan
Honduras
Guatemala
Costa Rica
Nicaragua
Cuba
Jamaica
Haiti
Puerto Rico
Trinidad
Curacao
Aruba
Bonaire
Caracas
Maracaibo
Barranquilla
Cartagena
Valparaiso
Concepcion
Antofagasta
Iquique
Arica
Callao
Lobitos
Talara
Chimbote
Trujillo
Salaverry
Paita
Manzanillo
Puerto Vallarta
Mazatlan
Guaymas
Ensenada
Cabo San Lucas
Manzanillo
Salina Cruz
Champerico
Corinto
Managua
Puntarenas
Golfito
Colon
Panama
Esmeraldas
San Francisco
Guayaquil
Lobitos
Talara
Chimbote
Trujillo
Salaverry
Paita
Lima
Callao
Pisco
Ilo
Arica
Iquique
Antofagasta
Concepcion
Valparaiso
Juan Fernandez
Mocha

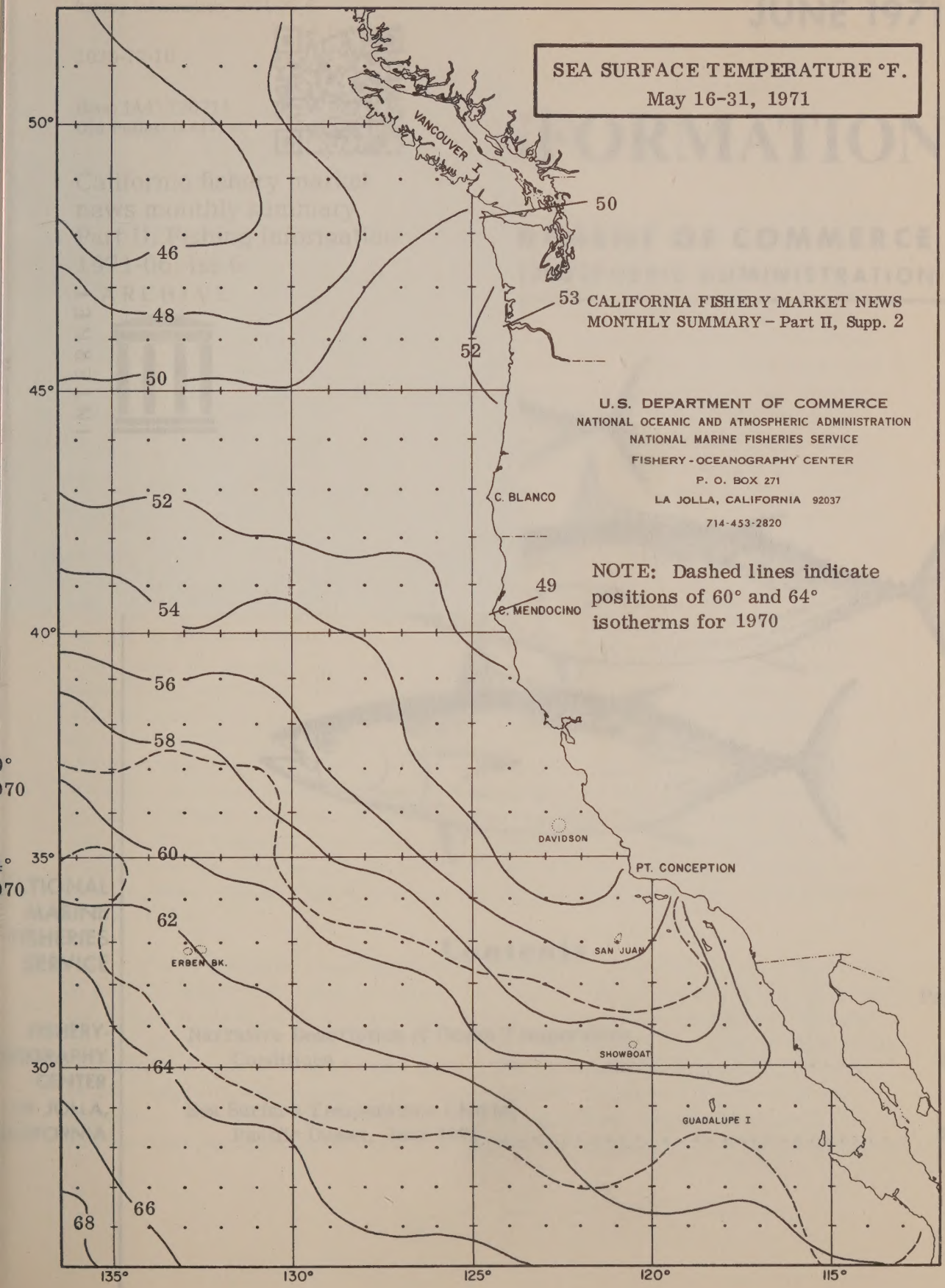

MAY 1-31, 1971
FIG.7-DEVIATION OF SEA SURFACE TEMP. (°F) FROM MAY 1970. SHADED AREAS COLDER IN 1971.
MEXICO
SOUTH AMERICA
CARIBBEAN SEA
GULF OF MEXICO
GULF OF PANAMA
GALAPAGOS IS.
MARQUESAS
TUAMOTU ARCHIPELAGO
SAMOA ISLANDS
COOK ISLANDS
YONGA ISLANDS
PHOENIX ISLANDS
UNION ISLANDS
KERMADEC IS
Honolulu
Acapulco
Salina Cruz
Guayaquil
Lima
Callao
Panama
Balboa
Manzanillo
Mazatlan
Guaymas
Tahiti
Rarotonga
Pitcairn I
Christmas
Canton I
180°
170°
160°
150°
140°
130°
120°
110°
100°
90°
80°
70°
30°
20°
10°
0°
40°


MAY 1961–1971
FIG. 8–OBSERVED MEAN VALUES
—0000— BAROMETRIC PRESSURE (MILLIBARS).
RESULTANT WIND DIRECTION.
No. RESULTANT WIND SPEED (KTS.).
No. AVERAGE WIND SPEED (KTS.) REGARDLESS OF DIRECTION.
1012
1016
1020
1024
1016
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.


MAY 1971
FIG. 9 - OBSERVED VALUES
-0000- BAROMETRIC PRESSURE (MILLIBARS).
RESULTANT WIND DIRECTION.
No. RESULTANT WIND SPEED (KTS.).
No. AVERAGE WIND SPEED (KTS.) REGARDLESS OF DIRECTION.
1004
1008
1012
1016
1020
1024
1020
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.


SEA SURFACE TEMPERATURE °F.
MAY 1 - 15, 1971
CALIFORNIA FISHERY MARKET NEWS
MONTHLY SUMMARY – Part II, Supp. 1
U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL MARINE FISHERIES SERVICE
FISHERY-OCEANOGRAPHY CENTER
P. O. BOX 271
LA JOLLA, CALIFORNIA 92037
714-453-2820
Note: Dashed lines indicate positions of 60° and 64° isotherms for 1970
VANCOUVER I
C. BLANCO
C. MENDOCINO
DAVIDSON
PT. CONCEPTION
SAN JUAN
SHOWBOAT
GUADALUPE I
ERBEN BK.
50°
45°
40°
35°
30°
135°
130°
125°
120°
115°
46
48
50
52
54
56
58
60
62
64
66
68
50
53
52
49




SEA SURFACE TEMPERATURE °F.
May 16-31, 1971
CALIFORNIA FISHERY MARKET NEWS
MONTHLY SUMMARY – Part II, Supp. 2
U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL MARINE FISHERIES SERVICE
FISHERY-OCEANOGRAPHY CENTER
P. O. BOX 271
LA JOLLA, CALIFORNIA 92037
714-453-2820
NOTE: Dashed lines indicate positions of 60° and 64° isotherms for 1970
VANCOUVER I.
C. BLANCO
C. MENDOCINO
DAVIDSON
PT. CONCEPTION
SAN JUAN
SHOWBOAT
GUADALUPE I
ERBEN BK.
50
53
52
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50°
45°
40°
35°
30°
135°
130°
125°
120°
115°